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TO THE FAUNA AND BIONOMICS OF GRASSHOPPERS (ORTHOPTERA: ACRIDIDAE) OF THE SOUTHERN YUKON, CANADA

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The list of 10 species of grasshoppers from Southern Yukon Territory is given. *Melanoplus packardii brooksi* is firstly recorded from Yukon Territory, and *Xanthippus corallipes brooksi* - from Alaska. The spatial and altitudinal distribution of grasshoppers in the vicinity of Kluane Lake is discussed.

KEY WORDS: Orthoptera, Acrididae, faunistics, boinomics, Canada.

Д.И.Берман,[1] С.Ю.Стороженко.[2] С.К.Холин[2]. К фауне и экологии саранчевых (Orthoptera: Acrididae) юга Юкона, Канада // Дальневосточный энтомолог. 1995. N 23. С. 1-8.

Дается список 10 видов саранчевых с юга территории Юкон, Канада. *Melanoplus packardii brooksi* впервые указавыется для Юкона, а *Xanthippus corallipes brooksi* - для фауны Аляски. Изучены особенности стациальнго и высотного распределения саранчевых в окрестностях озера Клуане.

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INTRODUCTION

This paper is based on material collected by first co-author during fild survey in Yukon Territory (Canada) in 1993-1994 years. Additional material from Alaska (U.S.A.) is studied also. All specimens were collected by D.I.Berman, so the collector's name is omitted in the text. The acridid fauna of Yukon is known better (Vickery, 1967; 1984; Vickery & Kevan, 1983) than habitats of species and their biotopic and altitudinal distribution. Among 13 species of Acrididae recorded by V.R.Vickery (1984) from Yukon Territory following four species were not found by us in the vicinities of Kluane Lake and Carmaks: *Melanoplus sanguinipes sanguinipes* (Fabricius, 1798), *Monopterus frigidus frigidus* (Boheman, 1846), *Chorthippus curtipennis curtipennis* (Harris, 1841) and *Aeropedellus arcticus* Hebard, 1935.

MATERIAL AND METHODS

The grasshoppers were collected in the vicinities of Kluane Lake and Carmaks (Southern Yukon, Canada). This region of the subarctic zone of North America have the most continental climate in New World. The mountain steppes and dry mountain tundra occur here as well as forests. Biotopic and altitudinal distribution of grasshoppers was studied in the vicinity of Kluane Lake, Caltus Bay. The stations were located between 800 and 1600 m above sea level. Lower part of a slope is covered by mosaic of the tall-grass, open grassy and short-grass sagebrush steppes with the spots of an aspen forest including the sparse trees of *Picea glauca*. Tundra-steppe and dry tundra occupy the top of the mountain above timber line (1400-1600 m). Eleven sites were studied, samples were taken from the open areas, not sheltred by trees or bushes. The grasshoppers were collected by sweep net (during one hour) using the standard method (Pravdin et al, 1972) in each of them. Observation of stations have been done in July 15-16 1993 and in May 19-26 1994. The temperature data for each station were obtained by A.V.Alfimov during 1993-1994 years.

LIST OF SPECIES

***Melanoplus borealis borealis* (Fieber, 1853)**

HABITAT. This species is usually found in cool, damp locations, bogs, and swampy areas, stream margins near ponds (Vickery, 1984). In the vicinity of Kluane Lake *M. borealis* is common on altitude 800-900 m in the tall-grass sagebrush and open grassy sagebrush steppe, and on 1450-1600 m in tundra-steppe and dry tundra.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 58 specimens.

DISTRIBUTION. Northern Nearctic from Alaska to Labrador; widely spreading throughout Yukon Territory.

Melanoplus kennicottii kennicottii **Scudder, 1878**

HABITAT. This species was collected on grassy slopes (Vickery, 1984). In the vicinity of Kluane Lake the specimens were found in all stations, but they are most abundant in the lower parts of dry tundra (49 specimens per hour).

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 187 specimens; Carmaks, 17-18.VII 1993, 5 specimens.

DISTRIBUTION. Occurs from Alaska and Yukon Territory to Montana, Wyoming and South Dakota.

Melanoplus bruneri **Scudder, 1896**

HABITAT. This species is usually found in forest areas, on grassy mountain slopes or rangelands where bushes and shrubs are common (Vickery, 1984).

MATERIAL. Canada: Carmaks, 17-18.VII 1993, 3 specimens.

DISTRIBUTION. In Canada it occurs from Quebec westward to British Columbia, north to Yukon; in United States it is known from Alaska and the states bodering to the Canada.

Melanoplus fasciatus **(Walker, 1870)**

HABITAT. This species seems always to occur in association with heath plants in the southern areas, but no records of biotopic association was available for the northern areas (Vickery, 1984). In the vicinity of Kluane Lake *M. fasciatus* is found at altitude 800 m in open grassy sagebrush steppe and on 1450-1600 m in tundra-steppe and in dry tundra.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 40 specimens; Carmaks, 17-18.VII 1993, 1 specimen.

DISTRIBUTION. This species is known throughout all Canada and most of the states of U.S.A. adjacent to Canada-U.S.A. border.

Melanoplus packardii brooksi **Vickery, 1979**

HABITAT. In United States of America it occurs in Jackpine forests and parklands (Vickery, Kevan, 1983). In the vicinity of Kluane Lake this species is found on altitude 800 m only in the tall-grass sagebrush steppe. On the coast of Kluane Lake and in the vicinity of Carmaks it was collected in forest clearings.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 4 specimens; Carmaks, 17-18.VII 1993, 3 specimens.

DISTRIBUTION. Here this subspecies is firstly recorded from Yukon Territory. Previously it was known from northern Saskatchewan and northern Alberta. *M. packardii packardii* Scudder, 1878 is widely distributed in Canada and northern U.S.A.

Chloealtis abdominalis **(Thomas, 1873)**

HABITAT. It is known mainly from the forest areas and parklands (Vickery, Kevan, 1983). In the vicinity of Kluane Lake this species occurs through all steppe slopes, but is more abundant in dry tundra where it is related with damp grassy locations.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 37 specimens; Carmaks, 17-18.VII 1993, 1 specimen.

DISTRIBUTION. This species widely distributed in Canada and Alaska, but in Yukon Territory it was found only in the southwest (Vickery, 1984).

Bruneria yukonensis **Vickery, 1969**

HABITAT. The habitat was virtually unknown (Vickery, 1984). In the vicinity of Kluane Lake it is one of the most abundant species. *B. yukonensis* inhabits tall-grass and open grass sagebrush steppe on altitude 800-1400 m.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 109 specimens; Carmaks, 17-18.VII 1993, 1 specimen.

DISTRIBUTION. It is known only from Yukon Territory, Canada.

Arphia conspersa **Scudder, 1875**

HABITAT. This species was found in forest clearings and grasslands, generally on sandy or gravelly soils (Vickery & Kevan, 1983). In the vicinity of Kluane Lake *A. conspersa* is collected at altitude 800-1100 m in the tall-grass sagebrush and open grassy sagebrush steppe, on the edges of aspen forest and on the gravelly soils on the lake coast.

NOTES. In Yukon adults have been found from early June through July because this species appears early in spring as it passes the winter as late instar nymphs (Vickery, 1984). In the vicinity of Kluane Lake adults are most abundant in May.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 9 specimens, 19-26.V 1994, 33 specimens; Carmaks, 17-18.VII 1993, 1 specimen.

DISTRIBUTION. North America from Alaska and Yukon Territory to Ontario, Minnesota and Montana.

Xanthippus corallipes brooksi **Vickery, 1967**

HABITAT. Found in grassy places on tundra (Vickery, 1984). We found it on the edges of aspen forest and on the gravelly soils on the lake coast and at altitude 800-1250 m in the tall-grass sagebrush and open grassy sagebrush steppe.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 14 specimens, 19-26.V 1994, 13 specimens; Carmaks, 17-18.VII 1993, 1 spe-

cimen. U.S.A.: Alaska, Yukon river lower Eagle, Eagle Baff and Kathul Mt., 24-28.VIII 1990, 3 specimens.

NOTES. Examined specimens have speckled tegmina and depression of vertex without conspicuous cross-ridges like typical *X. corralipes brooksi* from Mackenzie Delta, but color of hind tibia varies from yellow (as in typical *X. corralipes brooksi*) to red (as in *X. corralipes buckelli* Hebard, 1928 from Southern British Columbia, Idaho, Nevada and Montana). The life cycle of this and other subspecies of *X. corallipes* lasts two years (Vickery & Kevan, 1983). Adults occur from May to August.

DISTRIBUTION. This subspecies was known from Yukon and Northwest Territories (Canada) only. Here it is firstly recorded from Alaska (U.S.A.).

Camnula pellucida **(Scudder, 1863)**

HABITAT. Common in undisturbed areas, on roadside and grassy areas (Vickery, 1984). In the vicinity of Kluane Lake *C. pellucida* occurs in all types of station, but more numerous in the lover part of a slope.

MATERIAL. Canada: Kluane Lake, Caltus Bay, 15-16.VII 1993, 18 specimens; Carmaks, 17-18.VII 1993, 11 specimens.

DISTRIBUTION. Almost all Canada and United States of America.

SPATIAL DISTRIBUTION OF GRASSHOPPERS ALONG ALTITUDINAL GRADIENT

The biotopic and altitudinal distribution of nine species of grasshoppers in the vicinity of Kluane Lake is shown in the table. Almost all species (except *Chloealtis abdominalis*) were found in tall-grass sagebrush steppe on elevation of 820 m. *Melanoplus packardii* is recorded from this station only. The number of species in other stations varies from 2 to 5. All grasshoppers were found in the steppe biotopes, whereas only five species inhabiedt the dry tundra biotopes. Four species (*Melanoplus packardii, Arphia conspersa, Xanthippus corallipes* and *Bruneria yukonensis*) were found from steppe biotopes on elevation 800-1400 m only (the most common and abundant was *Bruneria yukonensis*). Three species (*Melanoplus borealis, M. fasciatus* and *Chloealtis abdominalis*) were found in both lower and higher parts of a slope, but they are more abundant in dry tundra on elevation 1450-1600 m. *Melanoplus kennicottii* is common through all slope and it was more abundant (about 50% of all specimens of grasshoppers) in II-VII and IX stations.

Assemblage relationships were analyzed using quantitative data from each station in redundancy analysis (RDA in CANOCO, Ter Braak, 1988; version 3.11). Forward selection of environmental variables was chosen to find out the significant variables that explain most of the variance of the species data (Ter Braak, 1990). *Melanoplus packardii* was omitted from the analysis because it

Table

Environmental characteristics of the observed stations and list of the species of grasshoppers showing the number of specimens collected by net per one hour in each station (species are arranged by their spatial preferences)

STATION	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Altitude (m)	821	912	1094	1246	1337	1398	1459	1490	1520	1550	1611
MNT	20.1	22.9	21.7	20.9	19.1	18.8	15.8	14.6	16.0	14.1	13.7
SPT	2160	2380	2140	1970	1700	1630	1320	1140	1270	1090	1040
MWT	-24	-28	-31	-38	-34	-34	-31	-30	-36	-32	-26
SPECIES:											
Melanoplus packardii	2	-	-	-	-	-	-	-	-	-	-
Arphia conspersa	1	-	2	-	-	-	-	-	-	-	-
Xanthippus corallipes	1	8	-	1	-	-	-	-	-	-	-
Bruneria yukonensis	25	7	6	18	31	22	-	-	-	-	-
Camnula pellucida	9	-	-	2	2	-	1	-	1	-	-
Melanoplus kennicottii	6	12	10	15	26	30	27	-	49	-	8
M. borealis	8	3	-	-	-	-	7	26	1	8	4
M. fasciatus	2	-	-	-	-	-	3	15	1	16	2
Chloealtis abdominalis	-	-	-	1	-	-	1	-	9	8	18
TOTAL SPECIMENS:	54	30	18	37	59	52	39	41	61	32	32
TOTAL SPECIES:	8	4	3	5	3	2	5	2	5	3	4

I - tall-grass sagebrush steppe; **II, III** - open grassy sagebrush steppe; **IV-VI** - short grass sagebrush steppe; **VII** - tundra-speppe; **VIII-XI** - dry tundra. MNT - mean temperature (C°) on the ground during 10-22.YII 1993; SPT - normal sum of positive temperature (C°) on the soil surface during 1993 year; MWT - mean of the extreme minimum of temperature (C°) of the soil (0-3 sm) during 1993-1994 years.

was found only at a single station. The altitude and mean temperature on the ground were the most important and significant (P<0.01) variables in explaining observed variation in the species composition. Sum of positive temperature on the soil surface and the mean extreme minimum of temperature had not significant influence on the species composition (P>0.7). Two significant variables account for 51.4% of the variance on the ordination diagram of RDA (fig.) (species-environment correlations on the first and second axes are very high (0.93 and 0.91, respectively). Nevertheless the position of species on the diagram shows no strong gradient in relation to altitude and mean temperature on the ground. It seems there are any unaccounted factor that is affected on the species

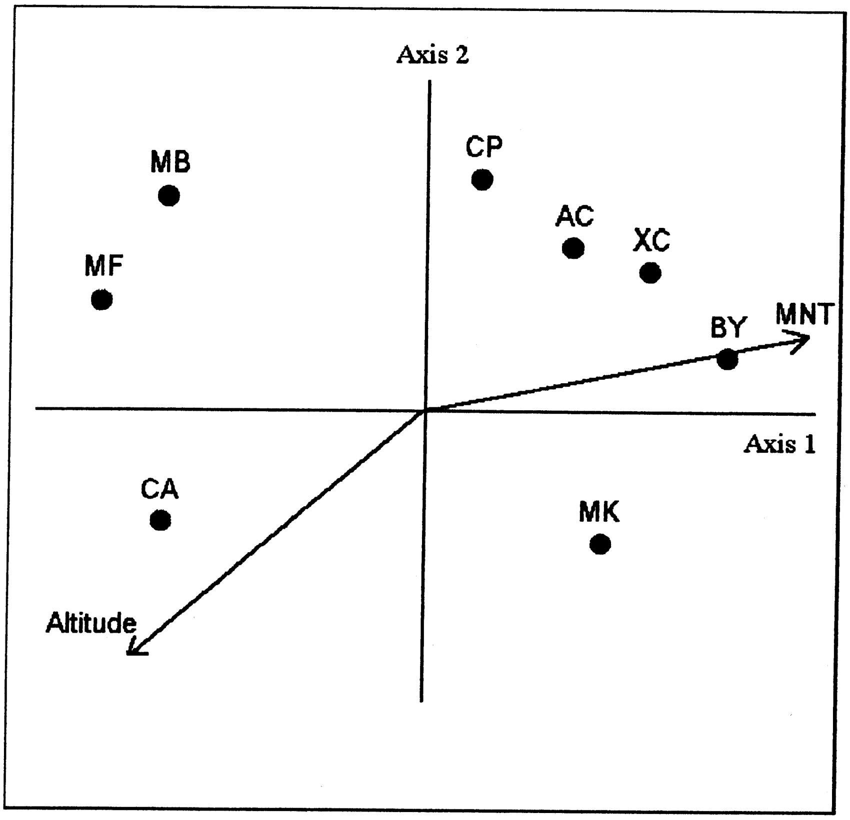


Fig. Ordination diagram based on redundancy analysis of 7 species of grasshoppers with respect to two significant environmental variables [arrows: altitude and mean temperature on the ground (MNT)] on the altitudinal and biotopic gradients. The species are: AC - *Arphia conspersa*, BY - *Bruneria yukonensis*, CA - *Chloealtis abdominalis*, CP - *Camnula pellucida*, MB - *Melanoplus borealis*, MF - *M. fasciatus*, MK - *M. kennicottii*, XC - *Xanthippus corallipes.*

composition. Obviously, spatial distribution of each species as well as species composition of grasshoppers depends on the vegetation type, the mean summer temperature of the soil and altitude, but not related clearly with another temperature factors like the extreme minimum of winter temperature on the soil.

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